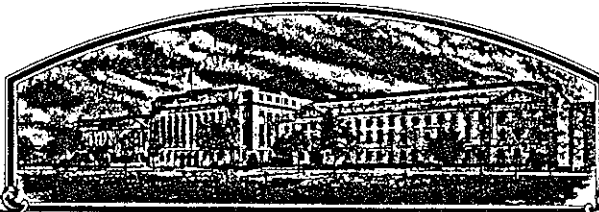


No.

8900181



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE
Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE; IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT (T. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

ALFALFA

'5683'

In Testimony Whereof, I have herewith set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this 30th day of April in the year of our Lord one thousand nine hundred and ninety.

Attest

Kenneth Howard
Commissioner

Plant Variety Protection Office
Agricultural Marketing Service

Clayton Yentler
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

FORM APPROVED: OMB NO. 0581-0055

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

1. NAME OF APPLICANT(S) Pioneer Hi-Bred International, Inc.		2. TEMPORARY DESIGNATION XAS61		3. VARIETY NAME 5683	
4. ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code) 7305 N.W. 62nd Ave., P.O. Box 287 Johnston, IA 50131		5. PHONE (Include area code) 515-270-3340		FOR OFFICIAL USE ONLY PVPO NUMBER 8900181	
6. GENUS AND SPECIES NAME Medicago sativa		7. FAMILY NAME (Botanical) Leguminosae		FILING DATE Apr. 18, 1989 TIME <input type="checkbox"/> A.M. <input type="checkbox"/> P.M.	
8. KIND NAME Alfalfa		9. DATE OF DETERMINATION August, 1986		AMOUNT FOR FILING \$ 1800.00 DATE Apr. 18, 1989	
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) Corporation				AMOUNT FOR CERTIFICATE \$ 200.00 DATE April 12, 1990	
11. IF INCORPORATED, GIVE STATE OF INCORPORATION Iowa				12. DATE OF INCORPORATION 1926	
13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS William T. W. Woodward, 7305 N.W. 62nd Avenue, P.O. Box 287, Johnston, IA 50131 Jerry Chicoine, 700 Capital Square, 400 Locust Street, Des Moines, IA 50309 PHONE (Include area code):					
14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED					
a. <input checked="" type="checkbox"/> Exhibit A, Origin and Breeding History of the Variety (See Section 52 of the Plant Variety Protection Act.)					
b. <input checked="" type="checkbox"/> Exhibit B, Novelty Statement.					
c. <input checked="" type="checkbox"/> Exhibit C, Objective Description of Variety (Request form from Plant Variety Protection Office.)					
d. <input checked="" type="checkbox"/> Exhibit D, Additional Description of Variety.					
e. <input checked="" type="checkbox"/> Exhibit E, Statement of the Basis of Applicant's Ownership.					
15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act.) <input type="checkbox"/> Yes (If "Yes," answer items 16 and 17 below) <input checked="" type="checkbox"/> No					
16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input checked="" type="checkbox"/> Foundation <input type="checkbox"/> Registered <input checked="" type="checkbox"/> Certified			
18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.? <input type="checkbox"/> Yes (If "Yes," give date) <input checked="" type="checkbox"/> No					
19. HAS THE VARIETY BEEN RELEASED, OFFERED FOR SALE, OR MARKETING IN THE U.S. OR OTHER COUNTRIES? U.S.A. Fall of 1988 <input checked="" type="checkbox"/> Yes (If "Yes," give names of countries and dates) <input type="checkbox"/> No					
20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable. The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.					
SIGNATURE OF APPLICANT PIONEER HI-BRED INTERNATIONAL, INC.				DATE 4/13/89	
SIGNATURE OF APPLICANT By: William T. W. Woodward				DATE 4/13/89 1	

EXHIBIT A

ORIGIN AND BREEDING HISTORY OF THE VARIETY

'5683'

5683 is a twenty clone synthetic with parental clones selected for forage yield based on progeny testing. In addition, clones were selected based on their evaluation for seed yield; resistance to spring black stem, Phytophthora root rot, spotted alfalfa aphid, and bacterial wilt. Six parental clones trace to Washoe, five to Caliverde 65, four to Lahontan and five to crosses among Washoe, Caliverde 65, and Lahontan. Prebreeder (Syn 1) seed was produced on parental clones in "cage isolation".

In 1986, approximately 200 randomly selected plants were transplanted into cage isolation to produce Syn 2 seed which was bulked and designated breeder seed.

During seed multiplication no variates beyond the limits defined under Exhibit C have been found. Multiplication procedures will insure that seed being sold as 5683 will not be shifted in characteristics beyond presently acceptable limits for alfalfa varieties.

It is confirmed that 5683 meets presently acceptable levels for uniformity for alfalfa varieties.

EXHIBIT B

NOVELTY STATEMENT

'5683'

5683 most closely resembles the variety '581'. 5683 differs from 581 in pea aphid resistance, being resistant to the insect while 581 has moderate resistance (Attachment II, Exhibit D). 5683 and 581 have 50.6% and 25.3% resistance plants, respectively, using data adjusted to CUF 101 at 70% resistant plants.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, MEAT, POULTRY & SEED DIVISION
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MARYLAND 20705

EXHIBIT
(A) (1)

OBJECTIVE DESCRIPTION OF VARIETY
ALFALFA (*Medicago sativa* sensu Gunn et al.)

NAME OF APPLICANT(S) Pioneer Hi-Bred International, Inc.	TEMPORARY DESIGNATION XAS61	VARIETY NAME 5683
ADDRESS (Street and No., or R.F.D. No., City, State, and Zip Code) 7305 N.W. 62nd Avenue P.O. Box 287 Johnston, IA 50131		FOR OFFICIAL USE ONLY PVPO NUMBER 8900181

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place numbers in the boxes to designate the expressions which are characteristic of the commercial generations of the application variety. Data for quantitative plant characters should be based on a minimum of 100 plants. Include leading zeros when necessary (e.g., 0 8 9) for quantitative data. Comparative data should be determined from varieties entered in the same trial. Plant color may be precisely designated by using any recognized color chart, e.g., The Munsell Plant Tissue Color Charts.

1. WINTERHARDINESS:

4

CLASS:

- | | |
|--|--------------------------------------|
| 1 - Very Non-Winterhardy (CUF 101) | 2 - Non-Winterhardy (Moapa 89) |
| 3 - Intermediately Non-Winterhardy (Mesilla) | 4 - Semi-Winterhardy (Lahontan) |
| 5 - (Du Puits) | 6 - Moderately Winterhardy (Saranac) |
| 7 - (Ranger) | 8 - Winterhardy (Vernal) |
| 9 - Extremely Winterhardy (Norseman) | |

TEST LOCATION: Kerman, CA

2. FALL DORMANCY:

FALL DORMANCY (DETERMINED FROM SPACED PLANTINGS)

TESTING INSTITUTION AND LOCATION	DATE OF LAST CUT	DATE REGROWTH SCORED	REGROWTH SCORE OR AVERAGE HEIGHT				LSD .06
			APPLICATION VARIETY	CHECK VARIETIES*			
				Lahontan	CUF 101	581	
Thorton, CA	10/14/87	11/5/87	25.6	22.9	43.6	27.6	3.32
Thorton, CA	10/14/87	11/5/87	25.3	20.4	42.2	25.0	2.21
Thorton, CA	10/14/87	11/5/87	27.4	22.5	44.6	30.7	2.98

* CUF 101, Moapa 89, Mesilla, Lahontan, Du Puits, Saranac, Ranger, Vernal, or Norseman as appropriate.

Specify scoring system used: Plant height measured in cm, 3 samples/plot; 4 reps of data each test

3

Fall Growth Habit (Determined from Fall Dormancy Trials)

- | | | |
|----------------------------|--------------------------|----------------------------|
| 1 - Erect (CUF 101) | 3 - Semierect (Mesilla) | 5 - Intermediate (Saranac) |
| 7 - Semidecumbent (Vernal) | 9 - Decumbent (Norseman) | |

3. RECOVERY AFTER FIRST SPRING CUT (In Southwest, first cut after March 21):

1

- | | | | |
|--------------------------|--------------------|---------------------------|-------------------|
| 1 - Very Fast (CUF 101) | 3 - Fast (Saranac) | 5 - Intermediate (Ranger) | 7 - Slow (Vernal) |
| 9 - Very Slow (Norseman) | | | |

TEST LOCATION: Thornton, CA; Kerman, CA

4. AREAS OF ADAPTATION IN U.S. (Where tested and proven adapted):

5

Primary Area of Adaptation

7

3

Other Areas of Adaptation

- | | | |
|--|-------------------------------|---------------|
| 1 - North Central | 2 - East Central | 3 - Southeast |
| 5 - Moderately Winterhardy Intermountain | 6 - Winterhardy Intermountain | |
| 8 - Other (Specify) | | |

- | | |
|------------------|------------------|
| 4 - Southwest | 5 - Great Plains |
| 7 - Great Plains | |



5. FLOWERING DATE (When 10% of plants possess open flowers at time of first spring cut):

<input type="text"/>	Days Earlier Than	<input type="text"/>
<input type="text"/>	Same As	<input type="text"/>
<input type="text"/>	Days Later Than	<input type="text"/>

1 - CUF 101

2 - Mesilla

3 - Saranac

4 - Vernal

5 - Norseman

TEST LOCATION:

6. PLANT COLOR (Determined from healthy regrowth 3 weeks after first spring cut, controlling leafhoppers if necessary).

☐

1 - Very Dark Green (524)

2 - Dark Green (Vernal)

3 - Light Green (Ranger)

COLOR CHART VALUE (Specify chart used):

APPLICATION VARIETY:

VERNAL:

TEST LOCATION:

7. CROWN TYPE (Determined from spaced plantings):

☐

Noncreeping Types:

1 - Broad (Vernal)

2 - Intermediate (Saranac)

3 - Narrow (CUF 101)

Creeping Types:

4 - Creeping Rooted (Rangelander)

5 - Rhizomatous (Rhizoma)

8. FLOWER COLOR (Determine frequency of plants for each color class as defined by USDA Agricultural Handbook No. 424 (Barnes 1972), allowing all plants in plot to flower):

% Purple and Violet (Subclasses 1.1 to 1.4)

% Blue (Subclasses 2.3 and 2.4)

% Variegated Other Than Blue (Subclasses 2.1, 2.2, 2.5 to 2.9)

% Yellow (Subclasses 4.1 to 4.4)

% Cream (Class 3)

% White (Class 5)

TEST LOCATION: Five Points, CA

9. POD SHAPE (Determine frequency of plants with the following pod shapes produced on well cross-pollinated racemes):

% Tightly Coiled (One or more coils, center more or less closed)

% Loosely Coiled (One or more coils, center conspicuously open)

% Sickle (Less than 1 coil)

TEST LOCATION:

10. PEST RESISTANCE: Provide in the appropriate column; trial data for application variety, and resistant (R) and susceptible (S) check varieties, synthetic generation tested, average severity index scores (ASI), least significant difference statistics (LSD .05), the institution in charge of test, year, and location of test, and whether test is a field or laboratory evaluation. Describe scoring system, and any test procedure which differs from standard methods proposed by Elgin (1982). Trial data from other test years or locations should be presented whenever available on a separate document as Exhibit D.

Seeds of the check varieties and germplasm lines listed below can be obtained from the USDA Field Crops Laboratory, Bldg. 001, Rm. 335, BARC-West, Beltsville, MD 20705. Although comparisons with check varieties listed below are preferred, comparisons with any appropriate check variety recommended by Elgin (1982) may be presented.

A. DISEASE RESISTANCE:	DISEASE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION FIELD OR LABORATORY
Anthracnose, Race 1 (<i>Colletotrichum trifolii</i>)	Application (S)	2	0.0	300 (approx.)		% resistant plants 6.8	Pioneer Hi-Bred International, Inc. 1988. Johnston, IA Laboratory	
	Arc (R)		68.4	300 (approx.)				
	Saranac (S)		0.0	300 (approx.)				
	SCORING SYSTEM: % surviving seedlings							
Anthracnose, Race 2 (<i>Collectotrichum trifolii</i>)	Application							
	Saranac AR (R)							
	Arc (S)							
	SCORING SYSTEM:							
Bacterial Wilt (<i>Corynebacterium insidiosum</i>)	Application (MR)	2	19.41	225 (approx.)	2.74	0.50	University of Minnesota 1987 Rosemount, MN field	
	Vernal (R)		42.00	225 (approx.)	2.22			
	Narragansett (S)		5.82	225 (approx.)	3.45			
	SCORING SYSTEM: Plants scored 0 and 1 (on a 1-5 scale, where 0=no disease, and 5=dead plant) considered resistant. Data adjusted to Vernal at 42% resistant plants by University of Minnesota.							
Common Leafspot (<i>Pseudopeziza medicaginis</i>)	Application							
	MSA-CW3AN3 (R)							
	Ranger (S)							
	SCORING SYSTEM:							

5

DISEASE	VARIETY	TESTED	PERCENT PLANTS	PLANTS TESTED	ASI	LSD .05	FIELD OR LABORATORY
Downy Mildew (<i>Peronospora trifoliorum</i>)	Application						
	Saranac (R)						
	Kanza (S)						
	SCORING SYSTEM:						
Fusarium Wilt (<i>Fusarium oxysporum</i> <i>f. medicaginis</i>)	Application (R)	2	45.63	225 (approx)	2.52	0.77	University of Minnesota 1987 Rosemount, MN field
	Agate (R)		54.00	225 (approx)	2.41		
	Narragansett (R)		22.06	225 (approx)	3.68		
	SCORING SYSTEM: Plants scored 0 and 1 (on a 0-5 scale, where 0=no disease, and 5=dead plant) considered resistant. Data adjusted to Agate at 54% resistant plants by University of Minnesota.						
Phytophthora Root Rot (<i>Phytophthora megasperma</i> <i>f. medicaginis</i>)	Application (R)	2	46.40	225 (approx)	2.78	0.75	University of Minnesota 1987 St. Paul, MN field
	Agate (R)		43.00	225 (approx)	2.90		
	Saranac (S)		16.69	225 (approx)	4.42		
	SCORING SYSTEM: Plants scored 1 and 2 (on a 1-6 scale, where 1=no disease, and 6=dead plant) considered resistant. Data adjusted to Agate at 43% resistant plants by University of Minnesota.						
Verticillium Wilt (<i>Verticillium albostrum</i>)	Application						
	Vertus (R)						
	Saranac (S)						
	SCORING SYSTEM:						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						
B. INSECT RESISTANCE:							
INSECT	VARIETY	SYN. GEN. TESTED	PERCENT DEFOLIATION	DEFOLIATION IN PERCENT OF RESISTANT CHECK	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION FIELD OR LABORATORY
Alfalfa Weevil (<i>Hypera postica</i>)	Application						
	Arc (R)			100			
	Saranac (S)						
	SCORING SYSTEM:						

10. B. INSECT RESISTANCE (Continued):

INSECT	VARIETY	SYN. GEN. TESTED	PERCENT SEEDLING SURVIVAL	NUMBER OF SEEDLINGS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION FIELD OR LABORATORY
Blue Alfalfa Aphid (<i>Acyrtosiphon kondoi</i>)	Application						
	CUF 101 (R)						
	PA-1 (S)						
	SCORING SYSTEM:						
Pee Aphid (<i>Acyrtosiphon pisum</i>)	Application (R)	2	50.6	200 (approx.)	4.9	% resistant plants 13.4 A.S.I. 0.67	Pioneer Hi-Bred International, Inc. 1987 Johnston, IA laboratory
	XXXXXXXX CUF 101 (HR)		70.0	200 (approx.)	6.1		
	XXXXXXXX Caliverde 65 (S)		8.9	200 (approx.)	2.8		
	SCORING SYSTEM: Plants scored 5-9 (on a 1-9 scale, where 9=no symptoms and 1=dead or severely stunted plant) considered resistant. Data adjusted to CUF 101 at 70% resistant plants by Pioneer Hi-Bred International, Inc.						
Spotted Alfalfa Aphid (<i>Therioaphis maculata</i>) Biotype, if known:	Application HR	2	76.1	Approx. 200	5.0	% Resistant Plants 12.69 A.S.I. 0.78	Pioneer Hi-Bred International, Inc. 1989 Kerman, CA Laboratory
	XXXXXXXX CUF 101 (R)		85.0	Approx. 200	5.6		
	Ranger (S)		0.0	Approx. 200	1.5		
	SCORING SYSTEM: Plants scored 7-9 (on a 1-9 scale where 9=no symptoms and 1=dead plant) considered resistant. Data adjusted to CUF 101 at 85% resistant plants by Pioneer Hi-Bred International, Inc.						
INSECT	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION FIELD OR LABORATORY
Potato Leafhopper Yellowing (<i>Empoasca fabae</i>)	Application						
	MSA-CW3An3 (R)						
	Ranger (S)						
	SCORING SYSTEM:						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						
C. NEMATODE RESISTANCE:							
NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION FIELD OR LABORATORY
Northern Root Knot (<i>Metoidogyne hapla</i>)	Application						
	Nev. Syn. XX (R)						
	Lahontan (S)						
	SCORING SYSTEM:						

10. C. NEMATODE RESISTANCE (Continued):

NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Southern Root Knot (<i>Meloidogyne incognita</i>)	Application						
	Mospe 69 (R)						
	Lahontan (S)						
	SCORING SYSTEM:						
Stem Nematode (<i>Ditylenchus dipsaci</i>)	Application (R)	2	45.0	300 (approx.)	4.06	% resistant plants	Pioneer Hi-Bred International, Inc. 1987 Connell, WA laboratory
	Lahontan (R)		60.0	300 (approx.)	4.79	11.6	
	Ranger (S)		16.8	300 (approx.)	2.52	A.S.I. 0.64	
	SCORING SYSTEM: Plants scored 7-9 (on a 1-9) scale, where 9=no symptoms, and 1=dead plant) considered resistant. Data adjusted to Lahontan at 60% resistant plants by Pioneer Hi-Bred International, Inc.						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						

11. INDICATE THE VARIETY THAT MOST CLOSELY RESEMBLES THE APPLICATION VARIETY FOR EACH OF THE FOLLOWING CHARACTERS:

CHARACTER	VARIETY	CHARACTER	VARIETY
Winterhardiness	Lahontan	Plant Color	---
Recovery After 1st Cut	581	Crown Type	581
Area of Adaptation	581	Combined Disease Resistance	581
Flowering Date	---	Combined Insect Resistance	Mesilla

REFERENCES

- Barnes, D.K. 1972. A System for Visually Classifying Alfalfa Flower Color. U.S. Dep. Agric. Handb. 424. 18 pp. (Note: Greenish cast of plate 6, A and B is an artifact of printing, actual colors a blend of yellow and white.)
- Elgin, J.H., Jr., (ed.). 1982. Standard Tests to Characterize Pest Resistance in Alfalfa Cultivars. U.S. Dep. Agric. Tech. Bull. (In Press).
- Gunn, C.R., W.H. Skrdla, and H.C. Spencer. 1978. Classification of *Medicago sativa* L. using legume characters and flower colors. U.S. Dep. Agric. Tech. Bull. 1574. 84 pp.
- Munsell Color Co. 1977. Munsell Plant Tissue Color Charts. Munsell Color Co., Inc. Baltimore.

NOTE: Any additional descriptive information and supporting documentation may be provided as Exhibit D.

APPLICATION FOR REVIEW OF ALFALFA VARIETIES FOR CERTIFICATION
National Alfalfa Variety Review Board

(The criteria for evaluation of applications were developed by the Joint Alfalfa Work Conference and the Association of Official Seed Certifying Agencies.)

Applicant's Name:

Date: November 15, 1988
(Revised January 26, 1989)

Pioneer Hi-Bred International, Inc.

Address:

P. O. Box 287, Johnston, IA 50131

Sponsoring Institution (if other than applicant):

Breeder's name (if other than applicant):

Variety Name: 5683 Experimental Designation: XAS61, YAS61

The breeder or sponsoring institution or organization must describe and DOCUMENT in this application those characteristics of the variety which give it distinctiveness and merit by supplying the information requested below. Information must be supplied for each category excepting those listed as optional. Action will be deferred unless the application is sufficiently documented.

I. A. Estimate the % of the germplasm sources listed below that contribute to the major genetic constitution of this variety.

	<u>M.falcata</u>	<u>Ladak</u>	<u>M.varia</u>	<u>Turkistan</u> 76	<u>Flemish</u>	<u>Chilean</u> 24	
	<u>Peruvian</u>	<u>Indian</u>	<u>African</u>	<u>Arabian</u>	<u>Unknown</u>		

B. A statement of origin (including variety names, germplasm releases and/or PI numbers, and the number of plants or % contribution from each) and the breeding procedures or methods and selection criteria used in developing the variety. Include the procedure for producing breeder seed, the generation (e.g. Syn 1, Syn 2, etc.) that is considered breeder seed, and the year of breeder seed production.

5683 is a twenty clone synthetic with parental clones selected for forage yield based on progeny testing. In addition, clones were selected based on their evaluation for seed yield; resistance to spring black stem, Phytophthora root rot, spotted alfalfa aphid, and bacterial wilt. Six parental clones trace to Washoe, five to Caliverde 65, four to Lahontan and five to crosses among Washoe, Caliverde 65, and Lahontan. Prebreeder (Syn 1) seed was produced on parental clones in "cage isolation". In 1986, approximately 200 randomly selected plants were transplanted into cage isolation to produce Syn 2 seed which was bulked and designated breeder seed.

C. Seed classes to be used, limitations on age of stand and areas of production for each class.

Seed Class	Synthetic Generation	Length of Stand Allowed	Limitation on Areas for Seed Production
Breeder	2	One	None
Foundation	3 or 4	Three	None
Certified	3, 4, or 5	Five	None

Only the synthetic generations given for the above seed classes are recognized as representing this variety. (No supporting data should be used in this application from Syn. generations other than those for the Breeder. Foundation and Certified Classes listed here).

D. Procedures for maintaining seed stock:

Adequate breeder seed (Syn 2) was produced in 1986 to last the life of the cultivar on approximately 200 plants in cage isolation. Seed classes will be breeder, foundation and certified. Foundation seed may be produced from breeder or foundation. The second generation foundation seed may be produced at the discretion of Pioneer Hi-Bred International, Inc. Both breeder and foundation seed will be maintained by Pioneer Hi-Bred International, Inc. Certified seed may be produced from breeder or foundation seed.

E. Any other requirements or limitations necessary to maintain varietal characteristics?

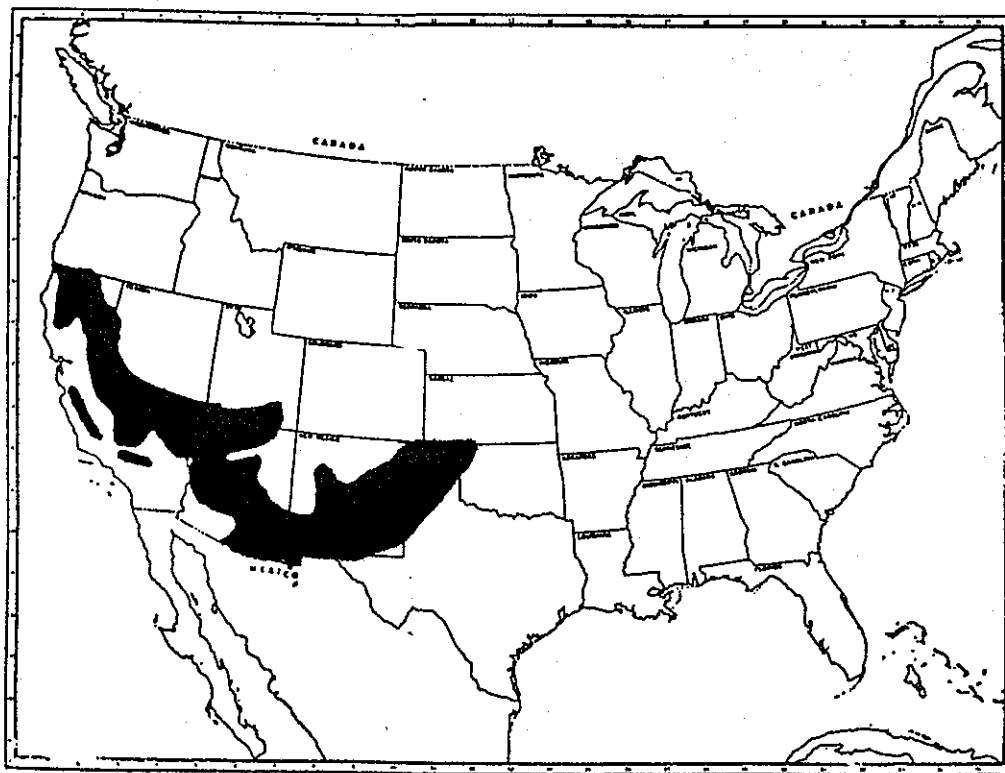
None

II. A. Describe the primary use of this variety (if for uses other than hay, haylage, greenchop or dehydration):

B. List states and areas within states where tested for forage and/or persistence. (Present data from each location in IIIA and IIIB.)

California

- C. Indicate proposed areas of adaptation and intended use on the map below.



III. Evidence of agronomic performance, including data on yield (in T/A) and persistence. Data may be from tests conducted by private firms, Agricultural Experiment Stations or USDA.

- A. Minimum required forage yield data is six location years with at least two locations (two locations must be at least 100 miles apart). Seeding year forage yield data cannot be used to satisfy this requirement. One location must have at least two harvest years beyond seeding year. Each harvest year should be listed separately.

Note: For non-dormant varieties (dormancy level of Moapa 69 or CUF-101) seeding year data may be accepted for up to two of the six location years when four or more cuttings are made in the seeding year.

Summarize Forage Yield Data below:

Test location	Date Plntd Mo/Yr	Syn Gen	Year Hvst	# Cuts	This Variety	Total Yield (DM T/A)			LSD .05	CV%
						2. ^a	3.	4.		
Fresno CA	3/87	2	1987	5	5.83	4.64			1.25	25.02
Fresno CA	3/87	2	1988	7	12.13	9.59			1.41	8.69
Fresno CA	3/87	2	1987	5	5.68	4.49			1.66	17.92
Fresno CA	3/87	2	1988	7	12.10	9.56			1.73	10.18
Fresno CA	3/87	2	1987	5	6.64	4.82			1.37	12.29
Fresno CA	3/87	2	1988	7	12.97	9.80			1.41	7.25
Fresno CA	2/88	2	1988	6	8.93	7.71			1.12	8.57
Thornton CA	3/87	2	1987	5	7.52	5.91			4.61	11.27
Thornton CA	3/87	2	1988	7	12.23	11.98			1.10	6.35
Thornton CA	10/86	2	1987	6	9.40	7.24			1.40	10.56
Thornton CA	10/86	2	1988	7	12.19	11.94			1.17	6.25
Thornton CA	10/86	2	1987	6	9.92	8.17			1.16	7.55
Thornton CA	10/86	2	1988	7	11.52	11.65			1.08	11.78
Thornton CA	3/88	2	1988	4	6.11	5.39			0.81	9.05

Mean Annual Yield

	Years Hvstd	Total # of Hvsts			
Ck 2 comparison	14	84	9.51	7.40	X
Ck 3 comparison					
Ck 4 comparison					

^a Lahontan

- B. Persistence (winter and drought tolerance, summer survival relative to check varieties). Enter dates of both initial and final stand estimates. Data must come from the area of adaptation and from stands at least two years old. More than one location must be given either when persistence is a trait used to justify release or when large diverse geographic areas of adaptation are recommended.

Test Location	Syn Gen	Date Seeded	Yrs. Hvtd	No. Hvts	Date of Readings Init/Final	% Stand				LSD .05	CV %
						This Variety In/Fnl	Check varieties Lahontan In/Fnl	CUF 101 In/Fnl	101 In/Fnl		
Kerman CA	2	Spr 87	2	12	Spring 87 Spring 89	103 102	97 100	94 93		4.8 2.4	4.7 1.7
Kerman CA	2	Spr 87	2	12	Spring 87 Spring 89	104 102	100 100	99 98		4.1 2.6	4.6 1.8
Kerman CA	2	Spr 87	2	12	Spring 87 Spring 89	103 101	95 100	96 92		5.7 2.3	3.5 1.7
Kerman CA	2	Spr 87	2	12	Spring 87 Spring 89	101 101	-- --	96 87		2.4 2.5	1.5 1.5

Scoring system used: Data taken as missing six inch units within each plot with total plot size = 120 units. Data is in % of mean.

C. Fall dormancy relative to recognized varieties

1. Test data

Test Location	Syn Gen	Date		Date Measures	This Variety	Score or average height check varieties			LSD .05	CV %
		Last Cut				1. ^a	2. ^b	3. ^c		
Thornton CA	2	10/14/87	11/5/87		25.6	22.9	43.6	27.6	3.32	8.0
Thornton CA	2	10/14/87	11/5/87		25.3	20.4	42.2	25.0	2.21	4.0
Thornton CA	2	10/14/87	11/5/87		27.4	22.5	44.6	30.7	2.98	6.0

Scoring system used: Plant height measured in CM, 3 samples/plot; 4 reps of data each test.

- ^a Lahontan
^b CUF 101
^c 581

2. Indicate which of the following check varieties this variety most nearly compares to in fall dormancy.

VERY DORMANT	DORMANT	MOD. DORMANT	NON-DORMANT	VERY NON-DORMANT
Norseman ()	Vernal () Ranger ()	Saranac () DuPuits () Lahontan (x)	Mesilla () Moapa 69 ()	CUF 101 ()

D. Seed production (this information optional)

Variety	Syn Gen	Test Location	Yrs. Tested	Average Yield (lbs/A)
This variety		No information		
1.				
2.				

IV. Other description characteristics

- A. Flower color at full bloom. Syn generation observed 3
(see USDA Agr. Handbook No. 424 - A system for visually
classifying alfalfa flower color).

<u>100</u> % purple	<u>0</u> % cream	<u>0</u> % yellow
<u>T</u> % variegated	<u>0</u> % white	

- B. Growth habit: (erect, semi-erect or decumbent)

Mid summer Erect
Fall Near erect, similar to Lahontan

- C. Optional: (Document distinctive characteristics such as
pod, leaf or root traits, biochemical markers, etc.)

V. Pest Resistance Characteristics

Please follow these instructions carefully when reporting pest
resistance results.

Furnish comparative data on the following insects and diseases (and others where applicable) for your variety. Data may be from tests conducted by private firms, Agricultural Experiment Stations, or USDA. Tests should be conducted by standard procedures as described in ARS Misc. publication 1434. Each disease and insect test must include recognized resistant and susceptible checks. Resistance levels should be characterized using % resistant plants as follows: S=<6%, LR=6-14%, MR=15-30%, R=31-50%, HR=>50%. Do not refer to tolerance. Checks should be characterized based on long term % resistance averages published in ARS Misc. publication 1434. If data for the resistant check does not fit its expected resistance class (MR, R, HR, etc.) data must be adjusted to the long term mean. If data has been adjusted, supply both adjusted and unadjusted values and indicate how and by whom the adjustment was made. If a scoring or rating system is used, specify the limits and meaning of scores. Pest resistance data must be submitted on at least four of the following nine pests: anthracnose, bacterial wilt, Fusarium wilt, Verticillium wilt, Phytophthora root rot, stem nematode, pea aphid, spotted alfalfa aphid, and blue alfalfa aphid. For the pests where no data is available write "Not tested". The four required pests must be selected from those that frequently cause significant losses on susceptible cultivars in the area of proposed adaptation of this variety. (Use the map you have shaded in IIC and compare with the maps of distribution and severity of alfalfa pests in ARS Misc. publication 1434. This will determine for which pests you must submit resistance information.) Show generation of seed used for each test.

ANTHRACNOSE (Race 1)

Test conducted by _____ at _____

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
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This variety Not adequately tested

1.
2.
3.

L.S.D. (.05)
(.01)
C.V. (%)

Scoring system used: _____

BACTERIAL WILT

Test conducted by Pioneer Hi-Bred International, Inc. at Arlington, WI

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
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This variety	MR	1987	2	6.28	11.71	3.3
1. Narragansett	S			1.27	2.37	2.8
2. Vernal	R			22.93	42.00	4.5
3.						
L.S.D.	(.05)			20.53		0.63
	(.01)					
C.V.	(%)			23.0		8.0

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no disease, and 1=dead plant) considered resistant. Data adjusted to 42% resistant plants by Pioneer Hi-Bred International, Inc.

BACTERIAL WILT

Test conducted by University of Minnesota at Rosemount, MN

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety	MR	1987	2	18.65	19.41	2.74
1. Narragansett	S			5.59	5.82	3.45
2. Ranger	MR			22.37	23.28	2.55
3. Vernal	R			40.37	42.00	2.22
L.S.D.	(.05)					0.50
	(.01)					
C.V.	(%)					14.34

Scoring system used: Plants scored 0 and 1 (on a 0-5 scale, where 0=no disease, and 5=dead plant) considered resistant.
Data adjusted to Vernal at 42% resistant plants by University of Minnesota.

FUSARIUM WILT

Test conducted by University of Minnesota at Rosemount, MN

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety	R	1987	2	47.20	45.63	2.52
1. Agate	R			55.83	54.00	2.41
2. MNGN-1	S			0.95	0.92	4.90
3. Narragansett	MR			22.82	22.06	3.68
L.S.D.	(.05)					0.77
	(.01)					
C.V.	(%)					19.38

Scoring system used: Plants scored 0 and 1 (on a 0-5 scale, where 0=no disease, and 5=dead plant) considered resistant.
Data adjusted to Agate at 54% resistant plants by University of Minnesota.

FUSARIUM WILT

Test conducted by Pioneer Hi-Bred International, Inc. at Quarryville, PA

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety	R	1987	2	29.5	36.7	4.64
1. Agate	R			43.4	54.0	5.25
2. MNGN-1	S			10.3	12.8	2.50
3.						
L.S.D.	(.05)			13.6	16.9	0.58
C.V.	(%)			25.8	25.8	7.7

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no disease and 1=dead plant) considered resistant.
Data adjusted to Agate at 54% resistant plants
by Pioneer Hi-Bred International, Inc.

VERTICILLIUM WILT

Test conducted by _____ at _____

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety		Not adequately tested				
1.						
2.						
3.						
	L.S.D.	(.05)				
		(.01)				
	C.V.	(%)				

Scoring system used: _____

PHYTOPHTHORA ROOT ROT

Test conducted by University of Minnesota at St. Paul, MN

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety	R	1987	2	60.99	46.40	2.78
1. Agate	R			56.52	43.00	2.90
2. Saranac	S			21.93	16.69	4.42
3.						
	L.S.D.	(.05)				0.75
		(.01)				
	C.V.	(%)				17.6

Scoring system used: Plants scored 1 and 2 (on a 1-6 scale, where 1=no disease, and 6=dead plant) considered resistant.
Data adjusted to Agate at 43% resistant plants by University of Minnesota.

STEM NEMATODE

Test conducted by USDA-ARS at Prosser, WA

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety	R	1987	2	34.7	65.7	
1. Washoe	R			28.5	54.0	
2. Apalachee	R			43.0	81.5	
3. Saranac	S			6.5	12.3	
4. Ranger	S			17.8	33.7	
L.S.D.	(.05)			16.4	31.1	
	(.01)					
C.V.	(%)			53.4	53.4	

Scoring system used: Plants scored 1 and 2 (on a 1-5 scale, where 1=no symptoms, and 5=dead plant) considered resistant. Data adjusted to Washoe at 54% resistant plants by Pioneer Hi-Bred International, Inc.

STEM NEMATODE

Test conducted by Pioneer Hi-Bred International, Inc. at Connell, WA

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety	R	1987	2	29.5	45.0	4.06
1. Lahontan	R			39.3	60.0	4.79
2. Apalachee	R			54.8	83.6	5.92
3. Ranger	S			11.0	16.8	2.52
4. Vernema	R			47.7	72.8	5.30
L.S.D.	(.05)			7.6	11.6	0.64
	(.01)					
C.V.	(%)			25.0	25.0	13.0

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no symptoms, and 1=dead plant) considered resistant. Data adjusted to Lahontan at 60% resistant plants by Pioneer Hi-Bred International, Inc.

PEA APHID

Test conducted by Pioneer Hi-Bred International, Inc. at Johnston, IA

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety	R	1987	2	57.1	50.6	4.9
1. CUF 101	R			79.0	70.0	6.1
2. PA-1	R			73.6	65.2	5.9
3. Caliverde 65	S			10.1	8.9	2.8
4. Fla 77	S			18.9	16.7	3.3
L.S.D.	(.05)			15.1	13.4	0.67
	(.01)					
C.V.	(%)			13.0	13.0	7.0

Scoring system used: Plants scored 5-9 (on a 1-9 scale, where 9=no symptoms, and 1=dead or severely stunted plant) considered resistant. Data adjusted to CUF 101 at 70% resistant plants by Pioneer Hi-Bred International, Inc.

SPOTTED ALFALFA APHID

Test conducted by Pioneer Hi-Bred International, Inc. at Fresno, CA

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety	HR	1989	2	49.6	76.1	5.0
1. CUF 101	R			55.4	85.0	5.6
2. Ranger	S			0.0	0.0	1.5
3.						
L.S.D.	(.05)			8.27	12.69	0.78
	(.01)					
C.V..	(%)			17.0	17.0	13.0

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no symptoms, and 1=dead plant) considered resistant. Data adjusted to CUF 101 at 85% resistant plants by Pioneer Hi-Bred International, Inc.

BLUE ALFALFA APHID

Test conducted by _____ at _____

Variety	Resistance class	Year Tested	Syn. Gen.	Unadjust. % R	Adjust. % R	Score or A.S.I.
This variety		Not adequately tested				
1.						
2.						
3.						
L.S.D.	(.05)					
	(.01)					
C.V.	(%)					

Scoring system used: _____

- VI. Summarize here the main advantages and characteristics of the variety. (Other than forage and seed yields.)

5683 is a moderately dormant variety which has resistance to Fusarium wilt, Phytophthora root rot, stem nematode, pea and spotted alfalfa aphid; moderate resistance to bacterial wilt.

- VII. If this variety is accepted by official certifying agencies, when will certified seed first be offered for sale? _____

Fall, 1988

VIII. Plant Variety Protection

- A. Will application be made for PVP?

Yes ☒ No ☐ Undecided ☐

- B. If yes, will the application specify that the variety is to be sold by variety name only as a class of certified seed?

Yes ☐ No ☒

- IX. As a means of added varietal protection, are you willing to have the information herein turned over to the PVP office?

Yes ☒ No ☐

Signature of Applicant

EXHIBIT D
ATTACHMENT II
'5683'

8900181

GH VARIETY PEA APHID (SD-ND) - JH 1987

ENTRY	ADJ		
	%RES	%RES	ASI
581	28.6	25.3	3.7
5929	69.0	61.1	5.6
85PN711	24.1	21.4	3.5
85PN721	68.1	60.3	5.8
85PS611	59.7	52.9	5.2
85PS621	48.0	42.5	4.7
86CN762	52.5	46.5	4.8
86CN782	76.5	67.8	5.8
86CN792	55.7	49.4	5.0
86CS672	37.5	33.2	3.8
86CS682	53.4	47.3	4.6
86CS692	29.1	25.8	3.5
86PJ911	65.5	58.0	5.6
86PJ921	60.4	53.5	4.8
86PN721	70.6	62.6	5.8
86PN731	73.6	65.2	5.6
86PN741	66.9	59.3	5.1
86PN751	71.8	63.6	5.8
86PS611	62.5	55.4	5.2
86PS621	53.3	47.2	4.7
86PS641	67.9	60.2	5.5
86PS651	43.0	38.1	4.4
86SI511	60.7	53.8	5.2
86SJ921	46.4	41.1	4.1
86SJ931	52.6	46.6	4.6
86SJ951	74.5	66.0	5.7
86SN711	63.8	56.5	5.5
86SN771	67.0	59.4	5.3
86SN801	66.2	58.7	5.3
86SS631	67.3	59.6	5.6
86SS661	66.1	58.6	5.0
CALVRDE	10.1	8.9	2.8
CUF101	79.0	70.0	6.1
FLA 77	18.9	16.7	3.3
MOA69	53.1	47.1	4.8
PA-1	73.6	65.2	5.9
YAS61(5683)	57.1	50.6	4.9

MEAN	56.6	50.2	4.9
LSD .05	15.1	13.4	0.67

*ADJUSTED TO CUF101 = 70% RESISTANCE

EXHIBIT E

STATEMENT OF THE BASIS OF APPLICANT'S OWNERSHIP

'5683'

Pioneer Hi-Bred International, Inc., Des Moines, Iowa, is the employer of the plant breeders involved in the development and evaluation of 5683. Pioneer Hi-Bred International, Inc. has the sole rights and ownership of 5683.